

Bertrand Afr. J. Infect. Dis. (2016) 10 (1): 1 – 9<http://dx.doi.org/10.4314/ajid.v10i1.1>**AIDS PREVENTION IN SUB-SAHARAN AFRICA: AS EASY AS ABC?****Robert L. Bertrand**

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Abstract

Background: The failure to stem HIV in sub-Saharan Africa and the unique epidemiological modes of infection within this region have demonstrated that unique strategies for combatting the virus are required. This review article discusses why international AIDS campaigns in sub-Saharan Africa have largely been unsuccessful, and what, if any, strategies have worked.

Methods: Articles were compiled using *Web of Science* and *Google Scholar* search engines.

Results: Inspired by past successes in the West and in Southeast Asia, Western AIDS initiatives have attempted to replicate these results within the African continent through 'risk reduction' approaches, vying to reduce the probability of HIV transmission per coital act via physical or biochemical barriers such as condoms, male circumcision, antiretroviral therapy, post-exposure prophylactic drugs, and treatment of sexually transmitted infections. However, more than three decades of research have demonstrated that the most successful strategies were African-inspired, relied on local resources with minimal Western support, culturally relevant, and used social engineering programs that dismantled networks of sexual relationships by promoting the practice of abstinence, reducing the number of sexual partners, discouraging multiple and concurrent relationships, delaying sexual debut, and maintaining mutually monogamous relationships.

Conclusion: Known through the mnemonic 'ABC' (Abstinence, Be faithful, Condoms), this strategy was first implemented in Uganda, yielding remarkable successes both in Uganda and thereafter in other African nations in stemming HIV. AIDS agencies should support and encourage programs that use this culturally sensitive, low cost, and effective strategy.

Keywords: Sub-Saharan Africa, HIV/AIDS, ABC, Risk Compensation, Sexual Networks, Multiple and Concurrent Partnerships, Uganda.

Introduction

The 'risk reduction' approach to HIV intervention is a strategy designed by the West that seeks to stem the spread of HIV by reducing the probability of infection per coital act through physical or biochemical barriers. These include condoms, male circumcision, antiretroviral therapy, post-exposure prophylactic drugs, and by treatment of sexually transmitted infections (STIs). These tools have all been proven effective in reducing viral transmittance under controlled settings (Anonymous, 2009; Hearst and Chen, 2004; Rotchford et al., 2000; Smith et al., 2005).

The risk reduction approach has been successfully applied in both developed and developing nations and with due appreciation of the local epidemiological modes of infection as well as socio-cultural concerns. For example, in the United States it was feared that advocating partner reduction and abstinence would be tantamount to making negative value judgements leading to the stigmatization of high-risk minorities such as commercial sex workers and the gay community. American public opinion is vehemently supportive of the separation of church and state and of constitutional protections against state-sponsored endorsement or condemnation of religions. State-sponsored avocation of behaviour adjustments such as practicing abstinence would have been interpreted by Americans as government endorsement of conservative religious attitudes. Public awareness of HIV became prominent in the United States after the culmination of the 1960's sexual revolution: Pre-marital sex was becoming socially acceptable, gay communities were fighting back against discrimination, the risk of STIs and pregnancy were diminished through oral contraceptives and antibiotics, and sexual imagery in social media and advertising became commonplace. For these reasons, epidemiologists and social theorists concluded that behaviour-adjustment approaches in the United States would have been met with recalcitrance and non-compliance (Green and Herling, 2006; Richens et al., 2003). The robust economy and infrastructure of the United States was compatible with expensive and logistically demanding risk reduction tools.

Other examples of the efficacy of risk reduction programs include Cambodia and Thailand: Epidemiological studies concluded that their large sex trades were pivotal to the epidemics. Commercial sex workers depend on their practice to make a living, and therefore, alternative strategies such as promotion of abstinence or partner reduction would have been ineffective. Implementations such as the '100 Percent Condom Program', mandating that brothel owners must enforce condom use with clientele, among other initiatives, reduced HIV prevalence within these two countries (Hearst and Chen, 2004).

Past successes in these and other nations signalled that similar risk reduction strategies could be successfully applied in sub-Saharan Africa. However, despite many programs of this substance, HIV within the continent remains tenacious and relentless, its persistence lamented as "one of the greatest failures in the history of public health" (Potts and Walsh, 2003, p. 1389). High viral prevalence persists despite aggressive condom promotion in many sub-Saharan countries (Cassell et al., 2006; Green and Herling, 2006; Hearst and Chen, 2004; Potts et al., 2008). Treatment of STIs has failed to reduce HIV transmission rates in almost every trial in Africa (Gray and Wawer, 2007; 2008). Antiretroviral therapy is logistically untenable and prohibitively expensive within developing economies, valued at 350 (US) dollars per infected person per year (Creese et al., 2002; Dieffenbach and Fauci, 2011; Walker, 2004). Voluntary counselling and testing, valued at 400 to 500 (US) dollars per infection avoided (Creese et al., 2002), is similarly prohibitive, and its implementation has not been demonstrated to reduce viral prevalence within developing settings (Corbett et al., 2007). Male circumcision appears to be the only risk reduction approach that is both effective and universally applicable, owing to its one-time

treatment, its existing prevalence in West Africa and among African Muslims, social acceptability, and its continuous effect with every act of intercourse (Anonymous, 2007; Halperin and Epstein, 2007; Potts et al., 2008; Weiss et al., 2008).

Problems with the Risk Reduction Approach

Risk Compensation and Emergent Compensatory Behaviours

Why have risk reduction approaches failed to reduce HIV prevalence in sub-Saharan Africa? Risk compensation psychology has been identified as a principle cause of failure, named by some researchers as the “Achilles’ heel” of AIDS prevention (Cassell et al., 2006, p. 605). Risk compensation is the adaptation of behaviour in response to changes in the severity of real or perceived threats. This could be thought of as a form of ‘threat homeostasis’ because threats to individual security are met with compensatory behaviours that restore the situation back to acceptable levels of endangerment. For example, soldiers with body armour will be less dis-inclined to place themselves in harm’s way, and construction workers without safety harnesses will more cautiously walk across high scaffolds.

Risk compensation was first recognized as an important consideration in health policy formulation when traffic engineers observed that mandatory seatbelt laws in the developed world did not reduce total vehicle-related deaths (Richens et al., 2000). Although seatbelts do reduce the severity and incidence of trauma among vehicle occupants, the awareness of protection among belted drivers resulted in emergent compensatory behaviours such as more reckless driving and faster driving. Consequently, although injuries and fatalities were reduced among belted drivers, injuries and deaths increased among non-belted passengers, pedestrians, and cyclists, resulting in no net change in total road-related fatalities (Richens et al., 2000).

Risk compensation has since been observed in the management of threats in a myriad of occupational and recreational settings (Assum et al., 1999; Autier et al., 1998; Morrongiello et al., 2007; Sawyer et al., 1999; Walker, 2007; Winston et al., 2006). Notably, the implementation of health products or policy may elicit compensatory behaviours that negate the benefits of the implementation or result in emergent negative outcomes. For example, it is known that individuals who wear sunscreen lotion are at greater risk of developing moles, a strong predictor of future development of melanoma skin cancer, because the knowledge of protection from ultraviolet radiation inclines sunscreen wearers to spend longer periods of time outdoors (Autier et al., 1998). Children who wear protective equipment designed to mitigate injury were observed to make more reckless movements potentially resulting in injury when placed in an obstacle course (Morrongiello et al., 2007). The safety procured through vehicles installed with airbags and antilock brakes is offset by compensatory behaviours that result in riskier driving (Winston et al., 2006). The aforementioned transfer of burden of injury and death from belted passengers to non-belted passengers, cyclists, and pedestrians, serves as a fourth example.

Compensatory behaviours is a likely explanation for the failure of risk reduction approaches in Africa: If the use of risk reduction tools such as antiretroviral therapy and condoms reduce the perceived lethality of HIV or risk of exposure to HIV per coital act, then these tools may inadvertently cause harmful behaviours to emerge that negate the effects of these tools or may even paradoxically result in further infections (Cassell et al., 2006; Hearst and Chen, 2004; de Irala and Alonso, 2006; Richens et al., 2000). As Cassell and colleagues (2006) have argued, the protective benefits of promoting condoms and other risk reduction tools could thus be “attenuated at the population level and could even be offset by aggregate increases in risky sexual behaviour” (p. 605).

What evidence is there that risk compensation psychology sabotages AIDS prevention programs? Kajubi and colleagues (2005) followed an Ugandan cohort who were issued free condoms and were educated on their use. After six months, this group was found to have increased their average number of sexual partners by 0.31 per person. In contrast, a control group who merely received information about HIV decreased their average number of partners by 0.17. Patients receiving antiretroviral therapy have also been observed to display riskier sexual practices such as using condoms less often or having more sexual partners (Chen et al., 2002; Katz et al., 2002; Van-de-Ven et al., 1999). For example, although the provision of antiretroviral therapy expanded from 4 percent to 54 percent among San Francisco gay men between 1995 and 1999, the number of men who reported both unprotected sexual intercourse and multiple sex partners increased from 24 percent to 45 percent, and rates of transmission of HIV to uninfected partners increased from 2.1 percent to 4.2 percent (Van-de-Ven et al., 1999). Epidemiologists have also observed that in urban African cities where antiretroviral therapy is accessible and affordable, AIDS is no longer perceived as a disease to be greatly feared, but is merely viewed by some as a problematic but manageable infection akin to malaria (Green and Ruark, 2011, p. 107-108).

Compensatory behaviours resulting in further risky sexual practices have also been observed with the use of post-exposure prophylactic drugs (Kalichman, 1998). Risk compensation is such a problem to AIDS policies that it has even contributed to the poor prognoses of some newly infected patients: A UK study has found that over one quarter of all newly infected individuals have HIV that evolved resistance to antiretroviral drugs because they had sexual intercourse with someone who was receiving antiretroviral therapy (UK Collaborative Group, 2001). Risk compensation will likely be the bane of vaccines against the virus (Blower and McLean, 1994). While voluntary counselling and testing promotes more condom use among those tested positive for HIV, the majority who test negative have been observed to either maintain risky sexual practices or adopt riskier sexual practices (Corbett et al., 2007; Matovu et al., 2007; Sherr et al., 2007; Weinhardt et al., 1999). Circumcised men have also been observed to have riskier sexual practices than uncircumcised men, likely in response to the awareness of decreased susceptibility to HIV (Bailey et al., 1999). Even efforts to reduce rates of condom failure during coitus by increasing condom thickness was met with compensatory reduction in the use of lubricant, resulting in no net change in condom failure rate (Golombok et al., 2001).

Inconsistent Condom Use, Poor Condom Efficacy, and Further Complications

Interventions relying on consistent condom use suffer several significant drawbacks. One concern relates to the efficacy of inconsistent condom use on HIV prevalence. Several studies have shown that condoms significantly reduce the risk of transmission of HIV per coital act (Carey et al., 1992; 1999; Lytle et al., 1997). Logic dictates that inconsistent condom use should provide a partial protective effect intermediate between consistent condom use and no condom use. But studies have instead shown that inconsistent condom uses are either equally likely or more likely to contract HIV and other STIs than non-users because of emergent compensatory behaviours (Hearst and Chen, 2004). As Ahmed and colleagues (2001) suggested, inconsistent condom use may actually be “an ‘enabling’ process allowing individuals to persist in high-risk behaviours with a false

<http://dx.doi.org/10.4314/ajid.v10i1.1>

sense of security” (p. 2177). This finding is troubling because it is difficult to encourage most condom users to use the product during each and every act of intercourse (Green and Herling, 2006). Recent studies among African individuals who have casual sexual relationships have estimated that the percentage of condom users who use condoms only inconsistently is 50 percent or greater (Matseke et al., 2012; Mehra et al., 2013; Davidoff-Gore et al., 2011). Inconsistent condom use is also problematic in developed countries such as the United States despite the fact that information is more accessible and economic and cultural barriers to condom use are negligible (Shih et al., 2011). These data suggest that efforts to stem HIV transmittance through condom promotion may be off-set by the prevalence of inconsistent condom use and associated compensatory behaviours.

Compensatory behaviours also appear to have a disproportionate effect on the efficacy of condom promotion programs when baseline rates of condom usage is low. Modelling performed by Richens and colleagues (2000) suggested that if condoms were used during 50 percent of all coital acts, and each individual engaged in sexual intercourse twice in six months on average, then the benefits of increasing condom use to 70 percent could be negated if compensatory behaviours resulted in one additional coital act per six months. If the baseline rate of condom use was only 10 percent, then adding one additional sex act can offset the benefits of 44 percent condom use. This parabolic relationship suggests that when baseline rate of condom use is very low, large increases in total condom consumption can be offset by relatively small increases in emergent compensatory behaviours. This modelling suggests that compensatory behaviours in Africa, where condom uptake is relatively low, may have pronounced effects on the efficacy of HIV reduction programs, as compared to Western countries where baseline condom usage is already quite high.

Another problem arises from low condom efficacy under actual settings as compared to condom efficacy determined under controlled settings. Although condoms have been determined to be approximately 90 percent effective in preventing HIV transmission (Hearst and Chen, 2004), these data were developed under controlled experimental settings: Motivated sero-discordant couples provided with new condoms and medical counselling. In addition to typical causes of condom failure such as slippage and breakage, other problems that are problematic (but not exclusive) within developing countries include heat degradation amidst poor storage conditions, inappropriate size of condoms used, and improper use (Green, 2003, p. 93; Green and Ruark, 2011, p. 145-156). Ahmed and colleagues (2001) have shown that when condoms are promoted in developing settings, condom effectiveness ‘on-the-ground’ is better estimated at only 63 percent. Although condoms do provide partial protection against transmission of HIV and other STIs per coital act, potential for viral transmission through product failure rises with continued reliance on condoms (Fitch et al., 2002; Mann et al., 2002). Considering that condoms break or slip in approximately 4 percent of coital acts (Grady and Tanfer, 1994; Macaluso et al., 1999), after 100 coital acts the chance that a user will experience product failure once or more can be estimated at 98 percent ($1 - 0.96^{100}$). In lieu of other preventative approaches to viral transmittance such as reducing sex partners or abstinence, risk compensation psychology may instead encourage individuals to rely on a product that does not guarantee 100 percent protection from HIV and places the user at cumulative risk for product failure and the risk of contracting HIV (Gordon, 1989).

Sexual Networks and Multiple and Concurrent Partnerships

Sub-Saharan Africa presents unique epidemiological modes of HIV transmission meriting discussion because of its implications on the design of effective health policies. Epidemiological trends in Africa are distinct from those observed in the West and in Southeast Asian countries. In countries such as the United States and Thailand, the HIV epidemic is centralized around several high-risk groups such as the gay community, injecting drug users, and commercial sex workers, with minimal exposure or risk of contracting the virus among the general population. In contrast, most African countries display a homogeneous distribution of viral burden across the general population. Those at greatest risk within the African continent are the youth, those who engage in casual sex, and those who have multiple and concurrent sexual partners. Those at least risk are married or long-term mutually monogamous couples and the sexually abstinent. Sexually active youth, comprising 40 percent of all new infections (Anonymous, 2006), are disproportionately vulnerable to HIV infection for several reasons, including lack of knowledge about HIV, poorly developed life skills, lack of financial autonomy and financial security, recent sexual debut, vulnerability to sexual coercion, vulnerability to domestic and partner violence, and decreased access to health facilities (Green, 2003, p. 42-52; Mavedzenge et al., 2011).

Studies have alarmingly revealed that when sexual relationships among African populations are mapped, the majority of Africans are interconnected within extensive networks of sexual contacts. For example, one study of the general population in Malawi observed that 65 percent of some 1000 survey respondents in seven separate villages were interconnected through multiple chains of relationships (Helleringer and Kohler, 2007). This is not unique to Africa: mapping the sexual relationships among all members of an American high school found that two-thirds of all students were linked within a single sexual network (Bearman et al., 2004). The difference between Africans and Americans is the prevalent tendency among Africans for adopting multiple and concurrent partnerships (Halperin and Epstein, 2007; Mah and Halperin, 2010). Although it has been documented that Westerners have more sexual partners throughout their lifetimes than Africans, these relationships occur successively: One monogamous relationship is typically ended before initiating another, a process known as ‘serial monogamy’. In contrast, many peoples within Africa, particularly within southern regions of the continent, have multiple long-term relationships that overlap for months or even years (Halperin and Epstein, 2004; 2007; Jana et al., 2008; Mah and Halperin, 2010). Like married couples, most long-term relationships of this variety are not viewed as casual or fleeting in nature but are held in trust and confidence. While condoms are often recognized as appropriate for short-term and casual relationships, they are usually unwelcome in long-term relationships and marriages for reasons of trust, sexual enjoyment, and various socio-cultural aversions (Chimbiri, 2007; Papo et al., 2011). Condoms are strongly associated with commercial sex and promiscuity, and to insist on condom use in steady and married relationships implies mistrust or infidelity (Green, 2003, p. 28). Condom use among individuals who have multiple and concurrent partnerships is consequently low (Jana et al., 2008).

These multiple and concurrent partnerships greatly exacerbate HIV epidemics because of they maintain active sexual networks (Halperin and Epstein, 2004; 2007; Mah and Halperin, 2010). Concurrent sexual relationships allows newly infected individuals to expose trusting partners to the virus when virulence is highest: The acute phase of HIV infection – typically lasting a month or longer – presents an initially high viral load in the genital mucosa and dramatically increased chances of transmission to uninfected partners. Although with treatment an individual may persist with HIV for years, this short acute phase is responsible for as many new infections as the entire latent phase thereafter (Brenner et al., 2007; Pinkerton, 2008). Serially monogamous relationships lock acute infections within closed partnerships, putting only the current partner at risk with a latent virus. In contrast, multiple and concurrent partnerships provide the sustained sexual networking necessary for the virus to rapidly spread during this acute phase (Halperin and Epstein, 2007; Mah and Halperin, 2010; Morris and Kretzschmar, 1997). Modelling has suggested that the difference

<http://dx.doi.org/10.4314/ajid.v10i1.1>

between practice of serial monogamy and practice of multiple and concurrent partnerships is an HIV epidemic ten times larger in size (Morris and Kretzschmar, 1997).

The pivotal importance of sexual networks in HIV transmission suggests that the best strategy for stemming infection rests not in reducing the risk of infection through risk reduction approaches but by collapsing the sexual networks within the general population that streamline the passage of HIV from person to person. This interpretation is supported by modelling studies that have concluded that reducing the number of sex partners within sexual networks has a larger impact on stemming an HIV epidemic than consistent condom use or treatment of sexually transmitted infections (Bernstein et al., 1998; Robinson et al., 1995). This interpretation is also supported by the examples of several African countries that have reduced HIV prevalence through social engineering programs that have promoted the delay of sexual debut, maintaining marital fidelity, and reducing total number of sexual partnerships. Examples and evidence of the efficacy of this alternative approach to the AIDS crisis are described below.

The African Approach

The ‘ABC’ Model

Social engineering programs vying to curtail risky sexual tendencies such as having multiple and concurrent partners have been demonstrably effective in reducing HIV prevalence in sub-Saharan Africa. Arguably the most remarkable case study is the example of Uganda, having used behaviour change promotion programs to reduce prevalence of HIV from 15 percent in 1991 to 5 percent in 2001 (Green and Herling, 2006). Extensive review has concluded that the reduction of viral prevalence occurred in Uganda because of a dramatic reduction in casual sex, delay in age of sexual debut, and reduction of multiple and concurrent partnerships (Genuis and Genuis, 2005a; Green et al., 2006; Green and Herling, 2006; Kilian et al., 1999; Kirby, 2008; Stoneburner and Low-Beer, 2004). For example, in 1989, 41 percent of males and 21 percent of females had more than one sex partner, whereas in 1995 the numbers dropped to 23 percent and 9 percent, respectively. Men reporting three or more sex partners fell from 15 percent to 3 percent during this same period (Green et al., 2006; Green and Herling, 2006).

Ugandan AIDS policy designers recognized the pivotal importance of youth in the long-term outcome of the AIDS crisis. In addition to the various vulnerabilities of youth to HIV discussed earlier (Anonymous, 2006; Green, 2003, p. 42-52; Mavedzenge et al., 2011), it is known that early sexual debut socializes sexual attitudes and behaviours that exacerbates sexually transmitted epidemics such as the HIV epidemic (McIlhaney and Bush, 2008). Earlier sexual debut is associated with higher lifetime number of sexual partners, greater propensity for engaging in acts of marital infidelity, and greater risk of contracting HIV (Pettifor et al., 2004; Population, 2002; White et al., 2000). As Genuis and Genuis (2005b) concluded on the effect of early sexual debut, the “fact that early initiation of sexual intercourse in adolescents is associated with a higher number of lifetime sexual partners and a consequent higher risk of contracting STDs, makes the promotion of delayed sexual debut in this population a critical step in partner reduction and the primary prevention of sexually transmitted infections” (p. 300). Uganda demonstrated that promotion programs can delay age of sexual debut among Ugandan youth by an average by two years (Asiimwe-Okiror et al., 1997). From 1994 to 2001, the percentage of Ugandan youth ages 13 through 16 in one Ugandan district who reported being sexually experienced decreased dramatically from 61 percent to 6 percent for males, and 23 percent to 2 percent for females (Green et al., 2006). Decline in HIV occurred despite comparatively dismal rates of condom use as compared to neighbouring countries (Green and Herling, 2006). Condom distribution was poor in Uganda, and improvements in condom supply did not improve until the decline in HIV prevalence already occurred (Slutkin et al., 2006). It appears that while risk reduction approaches require expensive drugs and condoms to be sustainably transported in immense quantities, often to those who are geographically or economically isolated, Uganda instead devised a remarkably effective “social vaccine” (Low-Beer and Stoneburner, 2004, p. 1) requiring minimal resource demand.

Implementation of the ‘ABC’ Model

How was this ‘social vaccine’ implemented and with such remarkable success? It is firstly notable that youth were very receptive to behaviour-adjustment promotions. This is because the majority of African youth were already practicing abstinence or limiting sex partners in response to the threat of HIV, often without major efforts from local governments and non-government organizations to encourage this behaviour (Green and Herling, 2006). As Green and Ruark (2011) noted, behaviour-based approaches to AIDS prevention “are not necessarily a matter of changing risky behaviour (for many), but rather of reinforcing existing healthy and protective behaviors” (p. 166). The sinews of this strategy were rooted not in extensive financial and material input, as per the *modus operandi* of risk reduction approaches, but through the combination of political will and community mobilization.

The Ugandan approach (Green, 2003; Green et al., 2006; Green and Herling, 2006; Green and Ruark, 2011) involved leadership from villages to the president, using AIDS programs established in multiple branches of government and throughout Ugandan communities. AIDS education and behaviour change promotions were integrated into school curricula, women and youth were empowered through parliament representation, and physicians cooperated with traditional healers, only the latter of whom the majority of Ugandans had access to when in need of medical care. Media promotions were ubiquitous yet low-tech, designed to be culturally appropriate, capable of reaching the economically isolated, and prioritized interpersonal means of communication. The very nature of the Ugandan AIDS epidemic was re-characterized within the national psyche as a ‘war’ against a ‘common enemy’: Community-based counsellors, educators, and other specialists were ‘recruited’, communities were ‘mobilized’, stopping HIV was ‘patriotic’, and those who were infected were ‘casualties’. This approach de-stigmatized the infected, and created an environment of openness about HIV, thereby allowing the infected to be spokespersons for behaviour change and bridging the motivational gap between community participation and individual change for many others. Secular powers cooperated with Muslim, Protestant, and Catholic organizations to provide HIV education to their laity and shelter for orphans whose parents have been killed by the virus. Uganda also expanded access to condoms, voluntary counselling and testing, treatment of sexually transmitted infections, and other risk reduction resources, to those unwilling or unable to change risky sexual behaviours, particularly among commercial sex workers.

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The Ugandan approach has since been referred to as the 'ABC' strategy. In order of priority: 'A' abstinence (delay sexual debut); 'B' be faithful (monogamy); and 'C' condoms (risk reduction). To clarify, Uganda did not neglect the provision of condoms and other risk reduction tools to those who wanted them, but merely prioritized behaviour change as the primary vehicle of AIDS reduction, with risk reduction tools as an important but secondary strategy. The term 'ABC' does not merely represent absence, being faithful, and use of condoms, but is a mnemonic representing extensive social engineering projects involving multiple facets of society. As Edward Green notes, "ABC is far from all that Uganda has done... [Uganda] pioneered approaches towards reducing stigma, bringing discussion of sexual behavior out into the open, involving HIV-infected people in public education, persuading individuals and couples to be tested and counseled, improving the status of women, involving religious organizations, enlisting traditional healers, and much more" (Cohen, 2004; p. 133).

Successes of the 'ABC' strategy in other African nations

Social engineering programs yielding gains in the fight against HIV have also been reported in other sub-Saharan nations. For example, between 1998 and 2003, Kenya adopted a behaviour change strategy that reduced the number of Kenyans reporting multiple sex partners by half as well as the number of youth who reported sexual activity by one third (Green and Herling, 2006). During this time, sero-prevalence of HIV declined from 10 percent to 6.7 percent (Green and Herling, 2006). Behaviour changes, with observed national declines in HIV prevalence, have also been observed in Burkina Faso, Cameroon, Côte d'Ivoire, Ethiopia, Malawi, Senegal, Swaziland, Tanzania, Zambia, and Zimbabwe, as well as developing countries beyond Africa such as the Dominican Republic and Haiti (Fylkesnes et al., 2001; Green et al., 2009; Gregson et al., 2010; Hallett et al., 2006; Kayirangwa et al., 2006; Low-Beer and Stoneburner, 2004; Mishra et al., 2009; Potts et al., 2008; Shelton et al., 2004).

The consistency of these positive developments have compelled HIV epidemiologists to conclude that behaviour change, not risk reduction, has been the principle cause of HIV decline in every sub-African general epidemic (Cassell et al., 2006; Genuis and Genuis, 2005b; Hearst and Chen, 2004; Shelton et al., 2004; Stammers, 2005). As researchers conclude, a "remarkably consistent element of success... seems to have been reductions in sexual partnerships" (Cassell et al., 2006, p. 606), that changes in sexual behaviour are "always present when HIV rates decline" (Stammers, 2005, p. 273), and that "no clear examples have emerged yet of a country that has turned back a generalized epidemic primarily by means of condom promotion" (Hearst and Chen, 2004, p. 41). It is also notable that the attribution of risk reduction tools to curtailing HIV prevalence in countries such as Thailand have been questioned amidst reports of a 50 percent reduction in total solicitation of commercial sex workers and comparable reductions in the rates of pre-marital and extra-marital sex (Genuis and Genuis, 2005b; Hearst and Chen, 2004; Low-Beer and Stoneburner, 2004; Phoolcharoen, 1998).

In contrast to risk reduction approaches, which require significant economical and infrastructural support, a remarkable feature of the ABC model is its apparent ability to succeed despite economic hardships. Between 1987 and 1992, when HIV incidence in Uganda dropped by more than half, Uganda spent 21 676 000 (US) dollars, equivalent to 25 cents per person per year (Low-Beer and Stoneburner, 2004). This is affordable for most developing countries without external donor support. Zimbabwe reduced HIV prevalence by half between 1997 and 2007, largely by promoting positive changes in sexual behaviours (Gregson et al., 2010; Hallett et al., 2006). This drop occurred despite political and civil unrest, agricultural land reform, and currency hyperinflation that devalued their dollar by more than 200 million percent, placing Zimbabwe at the world's lowest ranking on the Human Development Index. Uganda's approach in characterizing HIV as a 'battle' was intentional because this country was recently rattled by a civil war. Haiti is the poorest country in the Americas and is plagued with unrest, yet, this country was able to significantly reduce HIV prevalence through a hybrid risk reduction – social engineering approach (Hallett et al., 2006). Rwanda, still recovering from a brutal genocide in 1994, successfully reduced AIDS prevalence by 20 to 40 percent in urban centres between 1998 and 2003. These successes in Rwanda were again correlated with late average ages of sexual debut, low numbers of sexually active youth, and very low levels of multiple partnerships (Kayirangwa et al., 2006). Despite Niger having one of the lowest ratings on the Human Development Index, its AIDS prevalence is one of the lowest in Africa, estimated at 0.7 percent in 2006, down from 0.9 percent in 2002, a feat Potts and colleagues (2008) attribute to conservative sexual practices and male circumcision.

Limitations of the 'ABC' strategy

As described previously, the ABC strategy requires a culture milieu amenable to its implementation. Sub-African nations such as Uganda are well-suited for the ABC strategy because the majority of Africans were already adopting abstinence and reducing sex partners in response to the AIDS crisis, and therefore, social engineering projects were not necessarily inculcating new tendencies but simply re-enforcing existing ones. These countries also did not possess the sexual revolution culture and strong public opinion against government-sponsored endorsements of sexual lifestyle choices as seen in the United States. The ABC strategy exclusively targets sexual modes of HIV transmission within populations with a homogeneous distribution of infection risk. This social engineering strategy does not apply well to other epidemiological modes such as HIV transmission from injecting drug use, or heterogeneous distribution of infection risk concentrated in population sub-sets such as commercial sex workers. If these epidemiological modes are present, physical and biochemical risk reduction methods should be the primary strategy and behaviour change promotions a secondary one. Promotion of behaviour change is likely subject to 'AIDS fatigue' as individuals become weary of exercising HIV avoidance measures over long periods of time, eventually leading to loss of compliance with positive changes in sexual behaviours. Such 'AIDS fatigue' is likely to affect risk reduction strategies as well, for example, leading to loss of compliance in the use of condoms with each and every act of intercourse.

Concluding Remarks

In 2004, the Joint United Nations Programme on HIV/AIDS (UNAIDS), over 160 AIDS experts, and President Museveni of Uganda, recommended future AIDS interventions in sub-Saharan Africa prioritize fostering behaviour change as the primary strategy, with provision of risk reduction resources occupying an important, albeit secondary, role in AIDS prevention (Halperin et al., 2004). Despite these successes, the largest

<http://dx.doi.org/10.4314/ajid.v10i1.1>

resource investments as recommended by UNAIDS and other AIDS organizations are being made in risk reduction programs for which “evidence of large-scale impact is increasingly weak” and that “much lower priority is given to interventions for which the evidence of potential impact is greatest” (Potts et al., 2008, p. 750). Several AIDS epidemiologists have lamented political complications among Western AIDS agencies that have stonewalled the implementation of the Ugandan solution in other African nations (Timberg and Halperin, 2013; Green, 2011; Pisani, 2008). On the opposite end of the political interference spectrum also includes sponsorship of abstinence-only programs in Africa by Western Christian conservatives. These ineffective programs regrettably cite the Ugandan example despite having actual little comparison to the actual Ugandan strategy, of which this original architect of African AIDS prevention enacted comprehensive health policies including programs to provide condoms to those who want them, de-stigmatizing HIV victims, fostering open and honest conversations about HIV, among other initiatives.

Perhaps the irony of AIDS prevention in Africa, as Green and Ruark (2011) remark, is that although few AIDS programs have been successful, “the successes we have seen have happened largely without the presence of an organised, donor-funded program” (p. 248). Gains against HIV have instead come to fruition through low-cost approaches undertaken by the affected peoples themselves, using decentralized projects, education, political will, community efforts, and the media, to socially engineer a national psyche recognizing HIV as a problem that requires open dialogue, strong leadership, respect, and responsibility (Allen and Heald, 2004; Green et al., 2006; Low-Beer and Stoneburner, 2004; Wilson, 2004). For example, in three southern African countries, *Africare* recently implemented the Youth Empowerment and Support (YES!) program, an AIDS prevention program largely designed and directed locally by youth who promote culturally sensible messages of responsible sexual behaviour. Possessing an income generation component, this program is self-sufficient and is independent of external donor support, making this and similarly designed programs “viable model[s] of AIDS prevention that [seem] replicable elsewhere in Africa and beyond” (Green and Ruark, 2011; p. 76-77).

Africans have demonstrated that they are capable of creating their own solutions to the AIDS crisis. Well-meaning Western AIDS support agencies that wish to help the sub-Saharan continent should learn from the African example and support Africans in the implementation of these proven solutions.

Acknowledgements

I thank Michael Eze (University of Winnipeg, Canada) for his encouragements and for providing constructive commentary during earlier drafts of the manuscript. I thank two anonymous reviewers for their constructive commentaries on earlier drafts of this article. I also thank Peter Uzoegwu (University of Nigeria, Nigeria) for his hospitality during a research internship that was instrumental to the development of this article.

Conflict of Interest Statement: There are no conflicts of interest to declare.

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